Working Group 5

NuFact 2022 – Snowbird, Utah & U. Utah

Richard Ruiz on behalf of WG5

Institute of Nuclear Physics – Polish Academy of Science (IFJ PAN)

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welcome!

Thank you to fellow organizers, administrators, participants, chairs, speakers[1], and particularly Team WG5

Koun Choi (IBS) and Ian Shoemaker (Virginia Tech.)

[1] This is a gentle but very public reminder to upload your talks. ☺☺☺

which one is Working Group 5?

Working Group 5: New physics beyond PMNS

- Overlap with ν osc. (WG1), ν scattering (WG2), muons (WG4), ED&I++ (WG7)!

NuFact 2022 is the twentythird in the series of yearly international workshops which started in 1999. The main goal of the workshop is to review the progress of current and future facilities able to improve on measurements of the properties of neutral and charged lepton flavor violation, as well as searches for new phenomena beyond the capabilities of presently planned experiments.

The main goal of the workshop is to review the progress of current and future facilities able to improve on measurements of the properties of neutral and charged lepton flavor violation, as well as searches for new phenomena beyond the capabilities of presently planned experiments. The workshop is both interdisciplinary and interregional in that experimenters, theorists, and accelerator physicists from all over the world share expertise with the common goal of reviewing the results of currently operating experiments and designing the next generation of experiments. To allow for worldwide participation we plan to broadcast plenary sessions and make selected parallel sessions available. Plenary sessions will be mostly held in the mornings in Utah, which translates into convenient times for international participants from the Americans and Europe/Africa regions. NuFact will include some dedicated hybrid events with opportunities for remote participants to give presentations and to discuss with the in-person participants.

Before and during the conference we will also have several mini-workshops and panel discussions. We will have the following events: (1) **Multi-messenger Tomography of Earth Workshop (MMTE 2022)**[July 30-31, 2022], **(2) ESSnuSB+ Workshop, (3) Early career scientist career development workshop,** and a panel discussion on the Snowmass exercise.

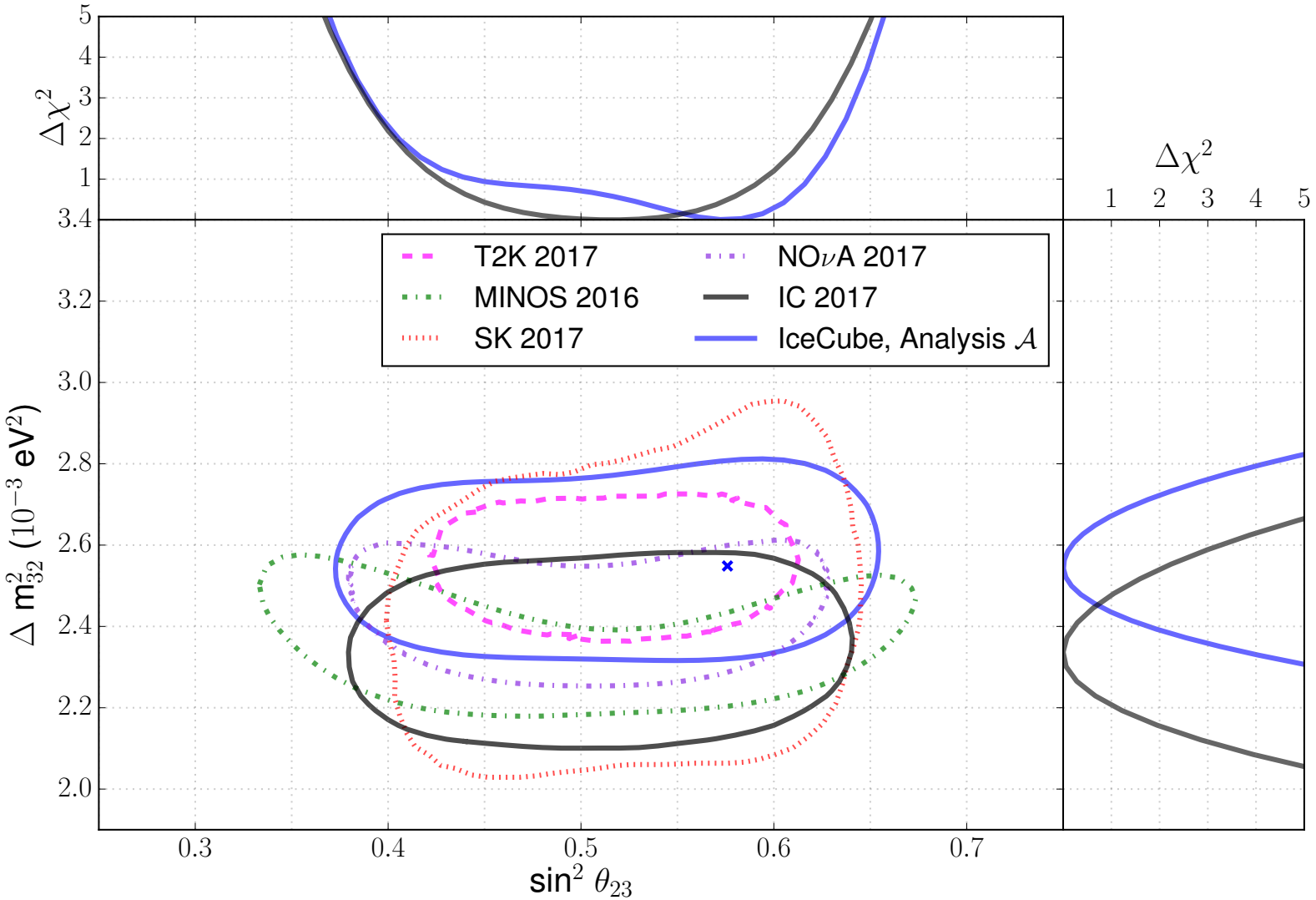
We are planning a fully in-person event. Plenary and selected parallel sessions will be streamed for world-wide participation. NuFact will include some dedicated virtual events with opportunities for remote participants to give presentations.

The **NuFact 2022** workshop program consists of plenary sessions, parallel sessions with **seven Working Groups** covering the following topics:

1. Neutrino Oscillation Physics (Working Group 1),
2. Neutrino Scattering Physics (Working Group 2),
3. Accelerator Physics (Working Group 3),
4. Muon Physics (Working Group 4), and
5. Neutrinos Beyond PMNS (Working Group 5)
6. Detectors (Working Group 6)
7. Inclusion, Diversity, Equity, Education & Outreach (Working Group 7)

new physics (and WG5 ☺!) is at the core of ν physics

Problem: according to the SM, $m_\nu = 0$. (The data disagree, obviously.)



IceCube[1901.05366]

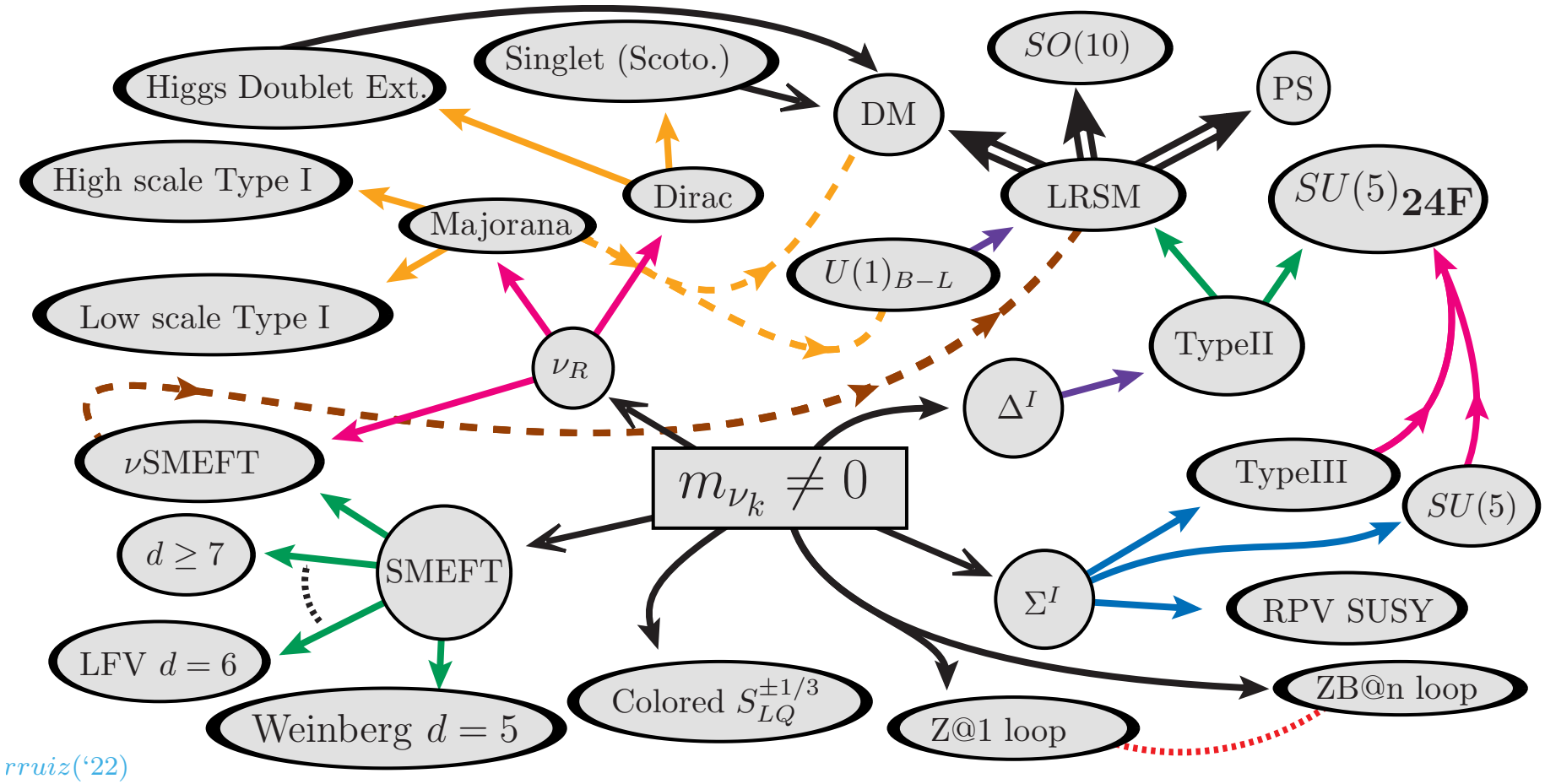
Guidance from data: ν favor the PMNS paradigm

Neutrino masses  ('15) $\Longrightarrow$ **so many open questions:**

- ν have mass. What is generating m_ν?
- ν masses are *tiny*. What sets the scale of m_ν?
- m_ν are nearly degenerate. What sets the pattern of m_ν?
- ν carry no QCD/QED charge. Are ν and $\overline{\nu}$ the same (Majorana)?
- Do ν and $\overline{\nu}$ interact differently (CPV)? **(probably)**
- Do ν communicate with non-SM particles (νNSI)?
- ...

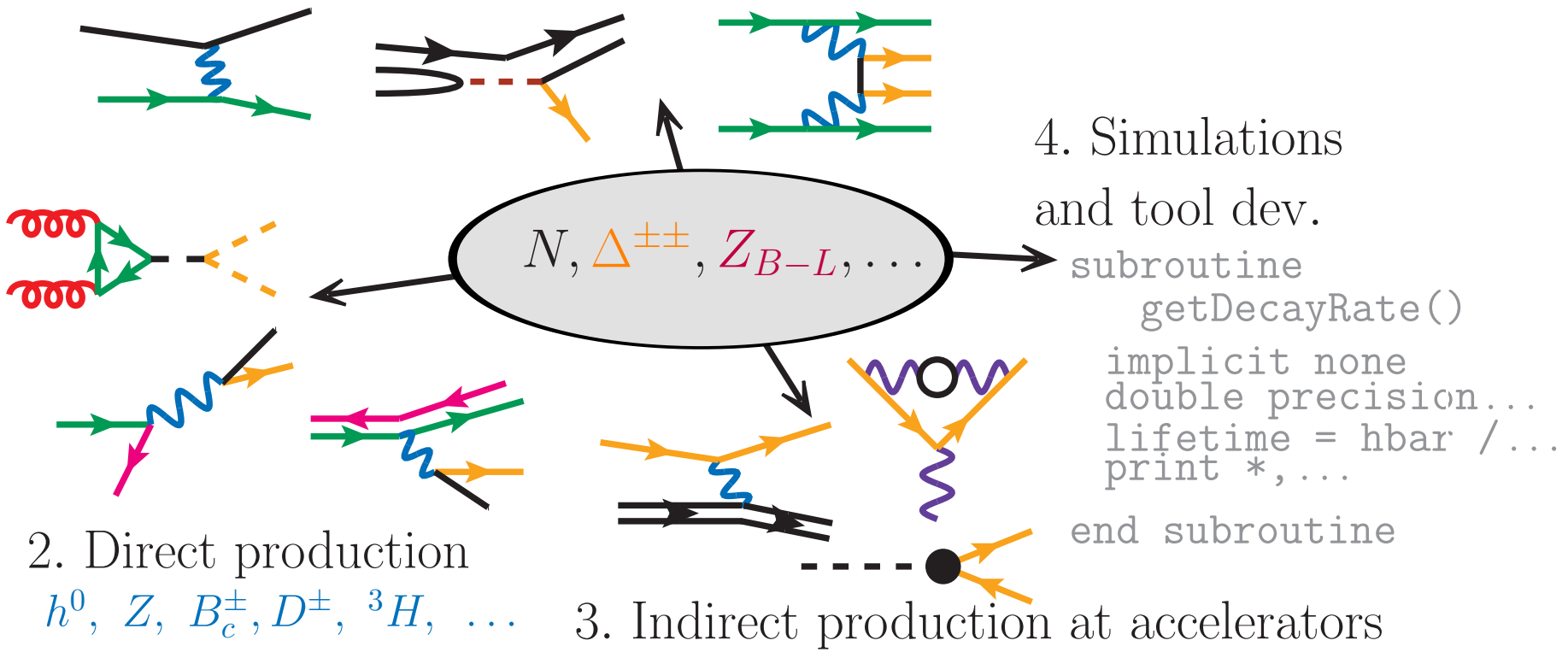
These questions can be realized and understood in ***many*** ways[2]

Minkowski ('77); Yanagida ('79); Glashow & Levy ('80); Gell-Mann et al., ('80); Mohapatra & Senjanović ('82); + *many* others



rruiz('22)

[2] For reviews on neutrino mass models and their tests, see, e.g.,
Y. Cai, J. Herrero-García, M. Schmidt, A. Vicente, R. Volkas [1706.08524];
Y. Cai, T. Li, T. Han, RR [1711.02180]; + Snowmass updates



Many complementary ways to explore neutrino physics

- colliders $\ell\ell$, ℓh, hh ☺
- short and long baseline experiments ☺
- space! (space-based telescopes) ☺
- space! (ground-, water-, ice-based telescopes) ☺

Working Group 5 Agenda

WG 5 by the numbers:

- $>$25 in-person and virtual talks (sooo many submitted abstracts)
- 5 hybrid sessions and 2 pure virtual sessions (thank you LOC for working with us)
- 1 joint session with Working Group 1 (ν osc) (thanks Adam, Jian, Mark!)
- **Guest chairs:** J. Berger (CSU), Z. Tabrizi (Northwestern), Y. Zhao (Utah) , K. Adamczyk (ISJ), D. Kim (TAMU)

Day 2 (Tuesday)

WG 5 Hybrid Session

- **Chair:** Josh Berger

	Cliff Conf Center Tent	12:30 - 14:00
14:00	**PMNS and the number of additional neutrino flavors** *Janusz Gluza*	
	Magpie B	14:00 - 14:30
	Search for an Anomalous Excess of Electron Neutrino Interactions in MicroBooNE and New Constraints on eV-Scale Sterile Neutrinos *Xiangpan Ji*	
15:00	**Heavy neutrino production at the FCC-ee: Dirac or Majorana?** *Alain Blondel*	
	Magpie B	15:00 - 15:30
	Coffee Break	
	Ballroom Lobby, Cliff Lodge	15:30 - 16:00

WG 1 + WG 5 Joint Session

	Coffee Break		
	Ballroom Lobby, Cliff Lodge		15:30 - 16:00
16:00	**Status of the Short-Baseline Near Detector at Fermilab**	*Miquel Nebot-Guinot*	
	Ballroom 2		16:00 - 16:18
	Short-Baseline neutrino oscillation searches with the ICARUS detector	*Alessandro Menegolli*	
	Ballroom 2		16:18 - 16:36
	Beyond the Standard Model Searches with the Short Baseline Near Detector (SBND)	*Supraja Balasubramanian*	
	Ballroom 2		16:36 - 16:54
17:00	**New sensitivties for eV-scale Sterile Neutrino Searches with IceCube**	*Alfonso Andres Garcia Soto*	
	Ballroom 2		16:54 - 17:12
	Beyond Standard Model Neutrino Oscillation Results from NOvA	*Dr V Hewes*	
	Ballroom 2		17:12 - 17:30

Day 4 (Thursday)

WG 5 Hybrid Sessions (two!)

- **Chairs:** Zahra Tabrizi and Yue Zhao

WG 5 Virtual Session (afternoon)

- **Chairs:** Koun Choi (remote)

16:00	Coherent neutrino scattering and the quenching factor measurement	*Jiajun Liao*
	Magpie B	16:10 - 16:35
	Neutrino oscillations in Earth: a unique tool to probe dark matter inside the Core	*Mr ANUJ KUMAR UPADHYAY*
	Magpie B	16:35 - 17:00
17:00	Favourable Conditions for Majorana Phase Appearance in Neutrino Oscillation Probabilities	*Dr Khushboo Dixit*
	Magpie B	17:00 - 17:25
	A New Approach to Probe Non-Standard Interactions in Atmospheric Neutrino Experiments	*Mr Anil Kumar*
	Magpie B	17:25 - 17:50
	Clockwork Fermions contribution to neutrino mass generation and Charged Lepton Flavor Violation l_i > l_j + \gamma	
18:00	*Gayatri Ghosh*	

Day 5 (Friday)

WG 5 Virtual Session (morning)

- **Chairs:** Ian Shoemaker (remote)

11:00	**Coffee Break**		
	Ballroom Lobby, Cliff Lodge		10:50 - 11:15
	Snowmass 2022: Connection between neutrino mass models and muon experiments	*Julian Heeck*	
	Wasatch A		11:15 - 11:55
12:00	**Probing BSM models at future high-precision long baseline experiments**	*Alessio Giarnetti*	
	Wasatch A		11:55 - 12:20
	Evolution of Lepton Number for Neutrinos	*Nicholas Benoit*	
	Wasatch A		12:20 - 12:45

WG 5 Hybrid Sessions (two!)

- **Chairs:** Karol Adamczyk, Doojin Kim

	Towards neutrinoless double beta decay in NEXT	*Gonzalo Diaz*
	Magpie B	14:20 - 14:50
	Tests of neutrino mass models at ATLAS	*Ben Wynne*
15:00	*Magpie B*	14:50 - 15:20
	Tests of neutrino mass models at CMS	*Collaboration CMS et al.*
	Magpie B	15:20 - 15:50
	Coffee Break	
16:00	*Ballroom Lobby, Cliff Lodge*	15:50 - 16:10
	MicroBooNE's Search for Anomalous Single-Photon Production in Neutrino Scattering	*Kathryn Sutton*
	Magpie B	16:10 - 16:39
	Cosmogenic Background Suppression at the ICARUS	*Biswaranjan Behera*
	Magpie B	16:39 - 17:08
17:00	**Recent Results from IceCube**	*Minjin Jeong*
	Magpie B	17:08 - 17:35
	Search for secluded dark matter with 6 years of IceCube data	*Christoph Toennis*
	Magpie B	17:35 - 18:00

The discovery of nonzero neutrino masses inspires many, many questions!

We hope WG5 talks will shed some light on these exciting mysteries!

Thank you!